

Isotomurus nebulosus, a new Pyrenean species of the *palustris* group

(Insecta, Collembola, Isotomidae)

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A new species of hydrophilous *Isotomurus* (Börner, 1903), *I. nebulosus*, spec. nov. is described from central Pyrenees, with remarks about coloration patterns as taxonomic characters in the genus.

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Introduction

The wet habitats of Europe bear a high diversity of Collembola of the hydrophilous genus *Isotomurus*, which are currently under study in our laboratories. The new species described here, *I. nebulosus*, spec. nov. was found in large numbers at several sites in the central Pyrenees, in association with other species of the genus.

Isotomurus nebulosus, spec. nov.

Figs 1–5

Types. Holotype: ♂, France, Haute-Garonne, Arbas, humid mosses on slopes at the entry of the Goueil di her cave, altitude 477m, June 1995. – Paratypes: 32, with same data. Types deposited in the collection of the Laboratoire d'Ecologie Terrestre, Université Paul Sabatier, Toulouse (France).

Description

Length. 2 mm.

Habitus. Habitus of *Isotomurus palustris* Müller 1776 (Fig. 1); claws and mucro not elongated.

Coloration. Yellowish brown. Pigmentation always present on antennae, especially on antennomere IV. Dorsal face of head and the cheeks yellowish, with a brown strip(e) between the antennal bases and a small brown median spot behind at $\frac{1}{3}$ of head length; body yellowish to light brown with slight drawing all over, ventral face lighter, yellowish. No longitudinal nor transversal stripes on tergites. 1 + 1 ventro-lateral brown spots on abdomen VI. Some large specimens have a darker background coloration. Thin borders pigmented in dark violet present on the lateral margins of the abdominal tergites III, IV and V. Empodium and claw pigmented. Legs and furca whitish.

Antennae. Of normal length for the *palustris* group, not elongated. Seven to nine short and thick S-chaetae on antennomere I and several on antennomeres II to IV.

Head. 8+8 eyes. Postantennal organ small and rounded. PAO/dcA = 0.9. Basal part of the labium with 10–15 chaetae. External lobe of the maxilla with 4 sublobal hairs (Fig. 2).

Tergites. Multiperforated sensory areas (pseudocelli-like, cf Deharveng 1980) present on the tergites, at least from thorax II to abdomen III. Dense coating of ordinary chaetae, differentiated in smooth mesochaetae and long ciliated macrochaetae. Long trichobothria, thin and ciliated, 3 + 3 on abdomen II, 3 + 3 on abdomen III (the lateral one shorter) and 1 + 1 on abdomen IV (Fig. 3). No modified chaetae on abdomen III of the male; the macrochaeta near the external posterior angle of abdomen III very similar in both sexes; it is straight, long, hyaline, acute at the apex but not tapered (Fig. 4). The following S-chaetae were detected on each side of the tergites (Fig. 5): 4 accp + 1 al + 1 ms on thorax II, thorax III and abdomen I; 5 accp + 1 al + 1 ms on abdomen II, 6 accp + 1 ms on abdomen III, 5 accp + 4 as on abdomen IV and 5 accp (the 2 internal longer) + 2 as on abdomen V (nomenclature of Deharveng, 1979).

Appendages. Ventral tube with 3 + 3 distal chaetae. Claw without internal or lateral tooth. Empodial appendage with an internal tooth. Tibiotarsal chaetotaxy of smooth ordinary chaetae and several ciliated macrochaetae. Femur with a long ciliated ventral macrochaeta. Tenaculum with 14 to 32 chaetae. Mucro quadridentate, without mucronal chaeta. Dentes ventrally with ciliated chaetae on the basal $\frac{1}{3}$, and none more distally; dorsally, chaetae are thinner, smooth and short; the internal side has ciliated chaetae, long in the basal $\frac{1}{3}$, and short in the distal $\frac{2}{3}$; externally, chaetae are medium or short and ciliated. No modified chaetae on anterior subcoxae of the male.

Derivatio nominis. *Nebulosus*, from the blurred coloration pattern of the species

Additional material. France: Ariège, Montségur, Montagne de Tabe, ruisseau du Lasset (1100 m), in numerous samplings made in 1994; Ariège, Arbon, Ruau (784 m), in numerous samplings made in 1994-1995; Ariège, Izaut de l'Hotel, source de la Maure (436 m), in numerous samplings made in 1994-1995.

Affinities and discussion

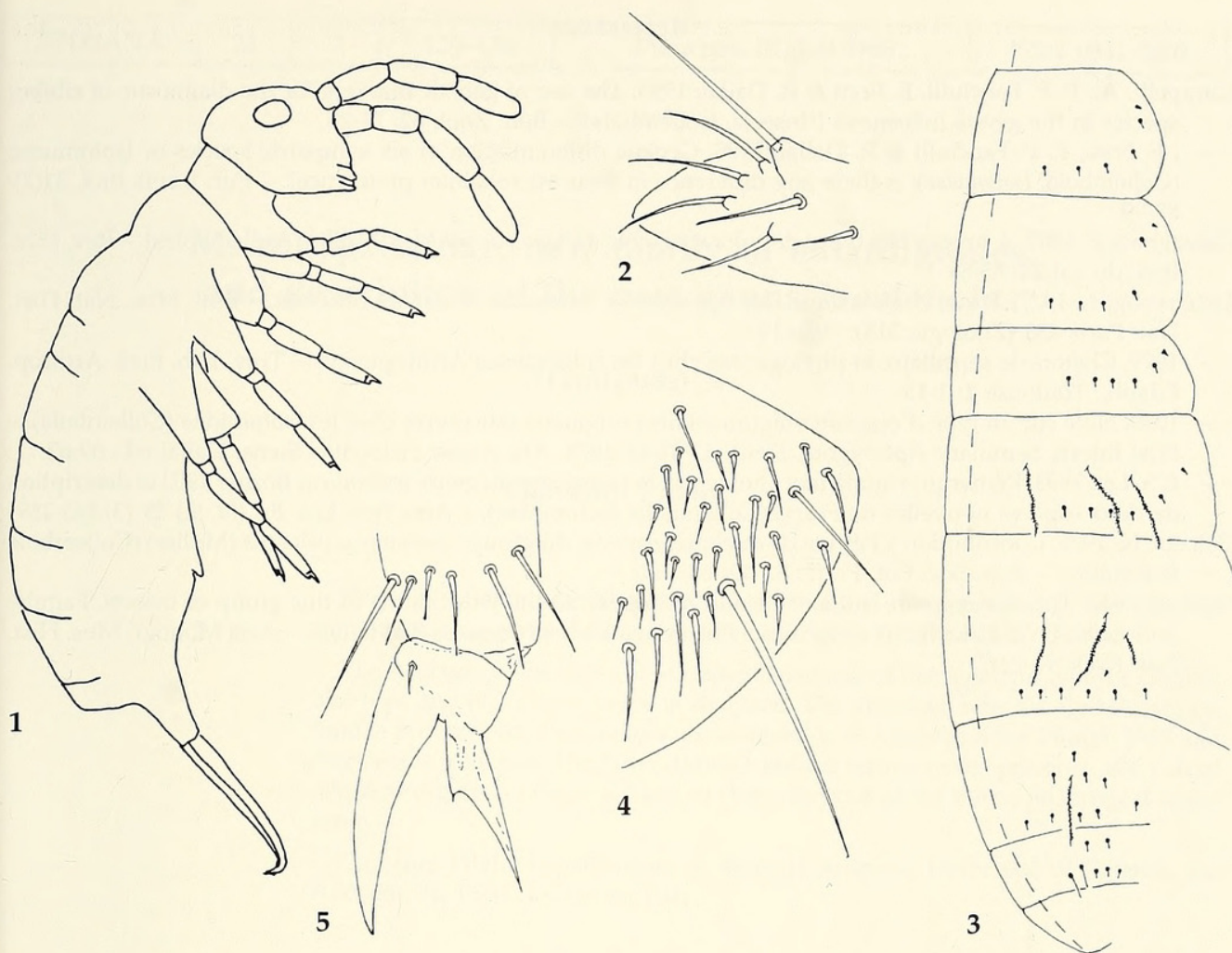
Isotomurus nebulosus has the chaetotaxic characteristics of the widespread *I. palustris* group as defined by Deharveng & Lek (1993), with a typical trichobothrial formula (3 + 3 + 1 on abdomina II, III and IV) and an identical distribution of S-chaetae on tergites of abdomina IV-V (3 as + 4 accp chaetae on abdomen IV, and 2 as + 5 accp chaetae on abdomen V). We give here the complete S-chaetotaxy of the tergites for *I. nebulosus* (Fig. 5), which seems to be very close to that of the other species of the group. The new species can be separated from the other forms of the *palustris* group by its colour pattern and the number and morphology of the modified male chaetae on abdomen III although this latter character is still unknown in several species.

Among the *Isotomurus* devoid of a dark longitudinal strip on the tergite axis, *I. nebulosus* has a color pattern similar to that of *I. maculatus*, Stach 1947 (= *I. hortorum* Cassagnau 1987 after Carapelli 1995). The dorsal drawings are however always blurred and poorly marked in the new species, whereas they are clear-cut (blue-grey on yellowish background) in *maculatus*. A differential character with *I. prasinus* Reuter, 1891, a species of the *palustris*-group devoid of dorsal drawings, is the absence of modified chaetae in the male. The several short, thickened and strongly ciliated chaetae present on abdomen III and on the anterior subcoxae in *I. prasinus* are absent in *I. nebulosus*.

Remarks on colour patterns in *Isotomurus*

The taxonomy of the genus *Isotomurus* is mostly based on the patterns of body pigmentation. The importance of this character is a consequence of the difficulty to study ordinary chaetotaxy, because of the intense plurichaetosis and the large variability in number of chaetae observed in all species of the genus. Most European forms of *Isotomurus*, and more particularly the "varieties" of the species *I. palustris* (Müller 1776), were primarily described on the basis of their colour patterns (Stach 1947, Poinot-Balaguer 1976, Cassagnau 1987). However, the latter author suggested that these chromatic forms might correspond to species, as their colour pattern did not vary during breeding experiments (Cassagnau personal communication). This view received a strong support from Carapelli et al. (1995a, 1995b) who were able to show by the use of molecular markers that several of these varieties were good species.

The models of pigmentation observed in *Isotomurus* species correspond to four different groups:



Figs 1-5. *Isotomurus nebulosus*, spec. nov. 1. Habitus. 2. External lobe of maxilla. 3. Dorsal chaetotaxy of S-chaetae and trichobothria. 4. Ventro-lateral chaetotaxy of abdomen III. 5. Apex of leg III.

1. Models exhibiting a longitudinal strip along the medial part of tergites with or without other colour pattern. (*I. alticolus* Carl, 1899, *I. palustris* Müller, 1776, *I. unifasciatus* Börner, 1901, *I. aquatilis* Müller, 1776 and *I. indipendente*, Carapelli et al., 1995).
2. Models with uniform coloration (*I. cassagnai* Deharveng & Lek, 1993, *I. italicus* Carapelli et al., 1995, *I. palliceps* Uzel, 1891 and *I. prasinus* Reuter, 1891).
3. Models showing transversal bands (*I. balteatus* Reuter, 1896 and *I. rabili* Deharveng & Lek, 1993).
4. Models with irregular patches of pigmentation (*I. maculatus* Schaeffer, 1896, *I. nebulosus*, spec. nov.).

Although there is a growing evidence that colour patterns are good specific characters in *Isotomurus*, they do not fit the groups based on chaetotaxy by Deharveng & Lek (1993). Thus, species with longitudinal stripes (chromatic group 1) belong to either the *palustris* group (*I. unifasciatus*, *I. aquatilis*), or the *alticolus* group (*I. alticolus*). Colour pattern has to be considered as specific rather than supraspecific character. *Isotomurus* is not an isolated case among Collembola in this respect, as the species taxonomy of at least two other large genera (*Orchesella* Templeton, 1835 and *Entomobrya* Rondani, 1861) is based on coloration.

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